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PATENT DEPARTMENT (51851)
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EXAMINER	
BRIER, JEFFERY A	

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/780,852	ROSENBERG ET AL.	
	Examiner	Art Unit	
	Jeffery A. Brier	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *82-90,92 and 102-106* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *82-90,92 and 102-106* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 05/12/2009 has been entered. The amendments to the claims overcomes the 35 USC 112 first and second paragraph issues set forth in the office action mailed on 01/12/2009.

Response to Arguments

2. Applicant's arguments filed 05/12/2009 concerning Adelstein have been fully considered but they are not persuasive. In the paragraph spanning pages 9 and 10 applicant argues:

> The Examiner states that one of ordinary skill in the art would know to use an aperture in either the shaft or the manipulandum to couple the two together; however, even if the Examiner's assertion is correct, this knowledge does not include that the aperture is oriented tangent to a rotational degree of freedom of the manipulandum. Further, there is no disclosure within Adelstein, and the Examiner has not provided any assertions that, even if such an aperture would have been known to one of skill in the art, the movement along the longitudinal axis of the strain gauge is through such an aperture. Claim 82 recites longitudinal movement through an aperture, not just that the manipulandum have an aperture and that the manipulandum is moveable along a longitudinal axis. Therefore, Adelstein in combination with the asserted knowledge of one of ordinary skill in the art does not disclose or suggest "the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis" as recited in claim 82. Thus, claim 82 is patentable over Adelstein in view of the knowledge of one of ordinary skill in the art as asserted by the Examiner.

This argument is not persuasive because Adelstein states in the first full paragraph on page 8: "This miniature joystick and decoupler arrangement allows measurement of interface forces tangent, to the two dimensional manipulandum workspace, without responding to pure moments applied at the handgrip.". This

teaches an aperature that allows "forces tangent, to the two dimensional maniplandum" to be measured. This argument is also not persuasive because the thrust bearing discussed in the first full paragraph on page 8 clearly allows some movement in the longitudinal axis even though the thrust bearing would inhibit movement along the longitudinal axis. Applicant has not claimed a range of movement outside of the range allowed for by the thrust bearing. Applicant has not claimed any use for having movement along the longitudinal axis while Adelstein has discussed use for having movement tangential to the longitudinal axis by "measurement of interface forces tangent to the two dimensional manipulandum workspace". See Baer, US Patent No. 4,976,008, in the Abstract and at column 2 lines 22 and 41, column 6 line 24, column 7 line 51, and column 8 line 54 which describes a thrust bearing inhibits but not prevents longitudinal movement.

Therefore, the previous prior art rejection based on Adelstein is maintained.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 82-88, 90, 92, and 102-106 are rejected under 35 U.S.C. 103(a) as being unpatentable over the article by Adelstein et al. titled Design and Implementation of a Force Reflecting Manipulandum for Manual Control Research DIC-Vol. 42, Advanced in Robotics, pp 1-12, 1992 cited on sheet 5 of 8 of 04/28/2008 IDS.

This article in the abstract , introduction, and beginning on page 4 under the Mechanical Configuration to page 12 describes the claimed apparatus noting

figure 4. Ground is discussed on page 3 second column first full paragraph. Flexible elements is inherently seen in figures 1-4 and 7 and discussed in the second paragraph under the heading Manipulandum Dynamic response on page 8 and page 4 first column last paragraph.

A detailed analysis of the claims follows.

Claim 82:

The following discussion of claim 82 is substantially identical to the discussion set forth in the office action mailed on 01/12/2009 with the only change being made is the replacement of "Fact 3" with the claim limitation discussed in Fact 3 on page 3 of the office action mailed on 01/12/2009. Also the reference in the obvious statement to "a first member having an aperture" was removed since it applies to claim 90.

82. (Previously Presented) An apparatus (figures 1-4 and 7), comprising:

a manipulandum oriented along a longitudinal axis (The article uses the word manipulandum, see at least the abstract. The maninpulandum moves in at least two degrees of freedom. The manipulandum (handle) is oriented along a longitudinal axis of a shaft. See page 8 second column first full paragraph. See figures 1, 3, 6, and 7.);

a linkage coupled to the manipulandum, the linkage configured to allow the manipulandum to move in at least two rotational degrees of freedom with respect to ground (See figures 1-6),

Adelestein does not fully teach the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis,

However:

Adelestein teaches 6 dof and 7 dof joysticks, see page 3 under the heading of Degrees of Freedom

Adelestein teaches adding a joystick between handle and shaft, see page 8 second column first full paragraph.

> A two axis strain gauge based 'finger-force" miniature joystick (Model 469120LB; Measurement Systems, Norwalk, CT), combined with a special thrust bearing decoupling mechanism, is embedded in the manipulandum linkage, between the handle shaft and the handgrip. This miniature joystick and decoupler arrangement allows measurement of interface forces tangent ,to the two dimensional manipulandum workspace, without responding to pure moments applied at the handgrip.

Adelestein additionally teaches the location of the miniature joystick is open ended since it is embedded in the maniulundum linkage.

Adelstein does teach allowing the manipulandum to move along a longitudinal axis of the handle shaft due to the "special thrust bearing decoupling mechanism" and the “strain gauge”. The measurement of forces tangent to the two dimensional manipulandum movement teaches some movement tangent to the two dimensional manipulandum movement to allow forces to be applied to the strain gauges. Thus, even slight movement allowed for by the "special thrust bearing decoupling mechanism" meets the claim limitation "the linkage further

configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis". Thus, Adelstein teaches a range of movement within applicant's range of movement, therefore, Adelestein still teaches this portion of the claimed invention until the claimed movement is claimed to be outside the range covered by the "finger-force" miniature joystick. See MPEP2131.03.

Adelestein does not fully teach the aperture aspect of claim 82 since the miniature joystick and special thrust bearing is placed between the handle and the shaft. Thus, Adelstein does not fully meet "through an aperture of a portion of the linkage along the longitudinal axis" since in this claim the linkage has an aperture (a hole) while Adelstein is unclear how the handle, miniature joystick, and shaft are mounted together.

One of ordinary skill in the art would have recognized there are two main ways for the handle to be attached to the shaft via the miniature joystick. One would utilize an aperture in the shaft and the other would utilize an aperture in the handle. In view of the finite and predictable ways to mount the handle, miniature joystick, and shaft together one of ordinary in the skill in the art at the time of the invention would have found “an aperture of a portion of the linkage” obvious at the time of applicants invention. KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007), U.S. Supreme Court No. 04-1350 Decided April 30, 2007, 127 SCt 1727, 167 LEd2d 705.

Adelestein further teaches the linkage including a plurality of elements, at least a subset of elements from the plurality of elements being flexible and

moveable to allow said manipulandum to move in at least one of said two degrees of freedom (Figures 1-4 and 7 shows and second paragraph under the heading Manipulandum Dynamic response on page 8 and page 4 first column last paragraph discusses flexible elements.); and

at least one sensor configured to detect at least one of a position and a movement of the manipulandum in the at least two degrees of freedom and output a sensor signal based on the detected at least one of the position and the movement (See sensor section on page 8.).

Claim 83:

83. (Previously Presented) The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force along at least one of the at least two degrees of freedom (A motor is connected to ground and a linkage. Figure 1 shows two motors. The abstract, Mechanical configuration section and the hardware implementation section discuss motor connected to the linkage.).

Claim 84:

84. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface (Ground is discussed in the Reference Frame section and Spherical Mechanical Design and other sections.);

a first extension member and a second extension member, the first extension

member and the second extension member being coupled to the ground member (See figure 4.); and

a first central member and a second central member, the first central member having an end coupled to the first extension member, the second central member having an end coupled to the second extension member, the first central member and the second central member being coupled to each other at ends opposite the ends coupled to the first extension member and the second extension member (See figure 4).

Claim 85:

85. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface (Ground is discussed in the Reference Frame section and Spherical Mechanical Design and other sections.);

a first extension member and a second extension member, the first extension

member and the second extension member being coupled to the ground member (See figure 4.); and

a first central member and a second central member, the first central member having an end flexibly coupled to the first extension member, the second central member having an end flexibly coupled to the second extension member, the first central member and the second central member being coupled to each

other at ends opposite the ends coupled to the first extension member and the second extension member (See figure 4).

Claim 86:

86. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface (Ground is discussed in the Reference Frame section and Spherical Mechanical Design and other sections.);

a first extension member and a second extension member, the first extension
member and the second extension member being coupled to the ground member (See figure 4.); and

a first central member and a second central member, the first central member having a first end coupled to the first extension member, the second central member having a first end coupled to the second extension member, a second end of the first
central member and a second end of the second central member being coupled to each other (See figure 4.),

the ground member being rotatably coupled to the first extension member and the second extension member by bearings, the bearings configured to permit rotation of the first extension member and the second extension member (See the Electromechanical Linkage spanning pages 7 and 8. The first, second and

fourth paragraphs of this section paragraph discuss bearings at the ground couple ground to the linkages.).

Claim 87:

87. (Previously Presented) The apparatus of claim 82, wherein at least one element from the subset of elements is narrower in a dimension in which that element is configured to flex, and is wider in other dimensions in which that element is configured to be substantially inflexible (See figures 1 and 4.).

Claim 88:

88. (Previously Presented) The apparatus of claim 82, further comprising:

a first actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force in at least one of the at least two degrees of freedom based on the sensor signal (See figures 1 and 4 which show a motor for each linkage connected to ground used to provided force feedback to the manipulandum.); and

a second actuator coupled to the ground member, the second actuator being configured to apply a feedback force in at least one of the at least two degrees of freedom based on the sensor signal, the feedback force associated with the second actuator being different from the feedback force associated with the first actuator (See figures 1 and 4 which show a motor for each linkage connected to ground used to provided force feedback to the manipulandum.).

Claim 90:

The analysis of this claim was modified to reflect the addition of "shaft of the" to this claim. Additionaly as done in the analysis of claim 82 the “Fact 3” was

replaced with the claim limitation discussed in Fact 3 on page 3 of the office action mailed on 01/12/2009.

90. (Currently Amended) An apparatus (figures 1-4 and 7), comprising:

a manipulandum having a shaft oriented along a longitudinal axis and configured to be moveable in at least two rotational degrees of freedom about axes of rotation with respect to ground (The article uses the word manipulandum, see at least the abstract. The maninpulandum moves in at least two degrees of freedom. The manipulandum (handle) is oriented along a longitudinal axis of a shaft. See page 8 second column first full paragraph. See figures 1, 3, 6, and 7.);

a first member (Adelstein: joint j5) coupled to the shaft of the manipulandum (Adelstein: See figure 4, joint j5 and see figures 1, 3, 6 where a shaft and handle are connected to joint j5.

Adelestein does not fully teach a first member ... having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground.

Adelestein teaches 6 dof and 7 dof joysticks, see page 3 under the heading of Degrees of Freedom

Adelestein teaches adding a joystick between handle and shaft, see page 8 second column first full paragraph.

> A two axis strain gauge based 'finger-force" miniature joystick (Model 469120LB; Measurement Systems, Norwalk, CT), combined with a special thrust bearing decoupling mechanism, is embedded in the manipulandum linkage, between the handle shaft and the

> handgrip. This miniature joystick and decoupler arrangement allows measurement of interface forces tangent ,to the two dimensional manipulandum workspace, without responding to pure moments applied at the handgrip.

Adelestein additionally teaches the location of the miniature joystick is open ended since it is embedded in the maniulundum linkage.

Adelstein does teach allowing the manipulandum to move along a longitudinal axis of the handle shaft due to the "special thrust bearing decoupling mechanism" and the "strain gauge". The measurement of forces tangent to the two dimensional manipulandum movement teaches some movement tangent to the two dimensional manipulandum movement to allow forces to be applied to the strain gauges. Thus, even slight movement allowed for by the "special thrust bearing decoupling mechanism" meets the claim limitation "the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis". Thus, Adelstein teaches a range of movement within applicant's range of movement, therefore, Adelestein still teaches this portion of the claimed invention until the claimed movement is claimed to be outside the range covered by the "finger-force" miniature joystick. See MPEP2131.03.

Adelestein does not fully teach the aperture aspect of claim 90 since the miniature joystick and special thrust bearing is placed between the handle and the shaft. Thus, Adelstein does not fully meet "a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the

manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground" since in this claim the first member has an aperture (a hole) while Adelstein is unclear how the handle, miniature joystick, and shaft are mounted together.

However, one of ordinary skill has the skill to place the miniature joystick at joint j5.

One of ordinary skill in the art would have recognized there are two main ways for the handle to be attached to the shaft via the miniature joystick. One would utilize an aperture in the shaft and the other would utilize an aperture in the handle.

One of ordinary skill in the art would have recognized the miniature joystick may be placed at joint 5.

In view of the finite and predictable ways to mount the handle, miniature joystick, and shaft together one of ordinary in the skill in the art at the time of the invention would have found "a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground" obvious at the time of applicants invention since the miniature joystick can be easily placed at joint j5 and the end of the shaft of the maninpulandum. KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007), U.S. Supreme Court No. 04-1350 Decided April 30, 2007, 127 SCt 1727, 167 LEd2d 705.

Adelestein further teaches:

a second member coupled to the first member and having a flexible characteristic (Adelstein: See figure 4, linkage between joints j5 and j3 and joints j3 and j2.); and

a third member coupled to the first member and having a flexible characteristic (linkages between joints j5 and j4 and joints j4 and j1.).

Claim 92:

92. (Previously Presented) The apparatus of claim 90, wherein, the second member has a first dimension about which the second member is configured to flex, and has a second dimension about which the second member is configured to be substantially inflexible (The linkages are thin thus they have flex.).

Claim 102:

102. (Previously Presented) The apparatus of claim 90, further comprising:

an actuator coupled to the manipulandum, the actuator configured to output a

feedback force along at least one of the at least two degrees of freedom (See figures 1 and 4 which show a motor for each linkage connected to ground used to provided force feedback to the manipulandum.).

Claim 103:

103. (Previously Presented) The apparatus of claim 90, further comprising:

a sensor configured to detect a position of the manipulandum along at least one of the at least two degrees of freedom and output a sensor signal based on the detected position (See sensor section on page 8.).

Claim 104:

104. (Previously Presented) The apparatus of claim 90, wherein the manipulandum includes one of a simulated surgical tool, a stylus, or a joystick (Starting on the last paragraph on page 4 to page 8 the term joystick is used many times.).

Claim 105:

105. (Previously Presented) The apparatus of claim 90, wherein, the third member has a first dimension about which the third member is configured to flex, and has a second dimension about which the third member is configured to be substantially inflexible (The linkages are thin, thus they have flex.).

Claim 106:

106. (Currently Amended) The apparatus of claim 90, wherein the second member is coupled to a first inflexible extension member (Adelstein: See figure 4, member between ground and linkage between joints j2 and j3.) and the third member is coupled to a second inflexible extension member (Adelstein: See figure 4, member between ground and linkage between joints j1 and j4.), wherein the first and second extension members are coupled to ground (Adelstein: See figure 4, ground.).

5. Claim 89 is rejected under 35 U.S.C. 103(a) as being unpatentable over the article by Adelstein et al. titled Design and Implementation of a Force Reflecting Manipulandum for Manual Control Research DIC-Vol. 42, Advanced in Robotics, pp 1-12, 1992 cited on sheet 5 of 8 of 04/28/2008 IDS as applied to claim 82 further in view of the article by Lorentz Levitation Technology: a New Approach to Fine Motion Robotics, Teleoperation, Haptic Interfaces, and Vibration Isolation, R. L. Hollis, S. E. Salcudean, 1993, 5th International Symposium on Robotics Research, Hidden Valley, PA, October 1-4, 1993, pages 1-18.

Hollis discusses Lorentz motors used in controlling a manipulandum or joystick and discusses on page 3 second column voice coil as an example of Lorentz motor.

Claim 89:

89. (Previously Presented) The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force along at least one of the at least two degrees of freedom, the actuator including a voice coil actuator configured to impart the feedback force on the manipulandum.

Adelstein is silent with regards to voice coil actuator, however, in view of Hollis it would have been obvious to one of ordinary skill in the art at the time of applicants invention to use a linear motor rather than a rotary motor to apply force to Adelsein's linkages because Hollis teaches linear motor such as voice coil motor is used to control a manipulandum.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffery A. Brier whose telephone number is (571) 272-7656. The examiner can normally be reached on M-F from 7:30 to 4:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached at (571) 272-7661. The fax phone Number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jeffery A. Brier/
Primary Examiner, Art Unit 2628